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Bexley Reading Study

By JOSEPHINE H. MACLATCHY

THE adaptation of wartime inventions and discoveries to consumers' peacetime uses is the theme of many advertisements nowadays. We are no longer surprised at the wonders wrought by the physical scientists. We are not accustomed, however, to hear of great discoveries in psychological laboratories. The visual-form training received by the cadets in the Navy Recognition Schools, which greatly increased the efficiency of the aviators and was later adopted by the air arm of the other services, including the British Empire Air Forces, was based on such a discovery. This training was devised for the Navy by Samuel Renshaw from the facts of visual form which he had accumulated in the psychological laboratory at Ohio State University during years of experimentation.

The training adapted to the air-school cadets of the Navy during the war is now being turned to peacetime uses. During 1944–45, five studies were in progress in which the techniques of visual-form training were being adapted to six-year-olds. The reading study with which this report is concerned was organized in Bexley, a suburb of Columbus, Ohio. It combined re-interpretations of old and tried techniques in reading instruction with new ideas and devices. During 1944–45, the six teachers, the Primary Supervisor, and the Superintendent of the Bexley schools joined the writer in a reappraisal of beginning reading.

The weekly group meetings were informal discussions for which assignments of readings in magazine articles and books were often arranged. The program was varied. Group activities were shared by all; committees studied particular areas which the members discussed before the group; and individuals carried through special investigations of problems met in their own experiences. Each teacher worked on a special committee.[1]

[1] The committee reports and teachers' papers on special subjects, with each teacher's report of her share of the testing programs, were collected in a mimeographed book of 150 pages.

The objective which actuated this program was to simulate for the child the reading experience of a competent adult reader. The adult reads new material to get new ideas. He re-reads only when he wishes to do so. To enable the children to read new material rather than to re-read, or to hear read again and again, the stories in a book with which they were familiar, we arranged eight to twelve books at the pre-primer, the primer, and the first-reader levels in a series of slightly increasing difficulty determined by the number of new words in each book. Before Christmas, the children were reading ten to twenty pages daily in books which they had not read before.

To develop the habit of seeing words as wholes, we introduced in February in the first grade a variation of visual-form training. The theory underlying this training is that through practice with as nearly meaningless material as can be found, during very brief exposures, it is possible to improve the individual's ability to see visual form. During the second semester, three training periods weekly were given in each classroom. The children made unusual progress during these four months. Tachistoscopic training shares credit with the other techniques used for the success of the program.

THE second-grade teachers took up the study of reading where the first-grade teachers stopped. They read and summarized most of the important studies of phonics reported since 1900. They experimented with the use of three-letter words and nonsense syllables as a means of developing the children's ability to see and hear the first syllable of polysyllables. They used devices to draw the children's attention to the common inflections of nouns, verbs, adjectives, and adverbs. For example, "the ways words add '*ed*'" was one type of inflection noted. The words which illustrated this statement were those which ended in "*ed*" in the day's reading selection. Short tests in objective form were arranged by the teachers to impress upon the children the importance of remembering and understanding what they had read. The practice of reading many books was continued. Each child read with a small group of his classmates who resembled him in reading proficiency. Each group read many pages of new material daily. Rapid oral reading of the non-dramatic type was commonly used in group reading. Audience oral reading was considered an art and was

prepared for special purposes. Silent reading was used for many purposes, but the books read were easier than those used in the oral-reading groups.

The second-grade teachers gave reading tests in September, January, and May, scored their pupils' papers, and interpreted the results which they tabulated. The combined report of the second-grade study is as long as that of the first grade.

The visual-form training was continued throughout the second year. The children who entered the first grade in the fall of 1945 received this training from October on.

Description of the Study

THE study of visual-form training started back more than ten years ago with the visit of Mr. Finkelstein, a Polish mathematical prodigy, to the Ohio State University campus. During a demonstration which he gave at an evening lecture in the chemistry auditorium, he drew a large square on the board and divided it into 100 small squares. He then asked volunteers in the audience to suggest a number to write in each of the squares. When he had finished writing, he looked at the figures for less than a second, turned his back on them, and was able to do all sorts of extraordinary feats. He could repeat the figures in any row or in any column, and he could reproduce those in the diagonals. Finally, he began in the middle and unwound the whole 100 squares. There was no question of his correctness because the audience was watching the numbers.

Mr. Renshaw took Mr. Finkelstein into the experimental psychology laboratory and studied his extraordinary perceptual abilities by means of the tachistoscope. The tachistoscope, by definition, is an instrument for displaying visual stimuli, which controls the time of exposure as well as the area exposed. Psychologists have elaborated the tachistoscope so that now they are able to regulate the time of exposure electrically to thousandths of a second. In fact, milliseconds are the units in which they designate lengths of exposure. With this very highly mechanized apparatus, Mr. Finkelstein set up world records in the time taken to memorize numbers comprising from 5 to 42 digits.

You will recall that Mr. Finkelstein started with extraordinary powers of perception. Most books on educational

psychology explain that everyone has a preferred form of perception by which he learns. He recalls more easily either what he sees, or what he hears, or what he experiences kinesthetically. The impression one gains is that these powers can be improved within narrow limits, but that whether the individual is a visual learner or not depends upon this inborn power. The research of Mr. Renshaw and his students in the years which have elapsed since Mr. Finkelstein established his records at the Ohio State University psychological laboratory has proved that it is possible for ordinary students greatly to increase their powers of visual perception. Some of them have even broken several of Mr. Finkelstein's records. Can you imagine memorizing 9 digits in 3 milliseconds—.003 seconds? You likely would say it is impossible to read them in that length of time, to say nothing of being able to memorize them so that you could repeat them. Yet last year, one student learned numbers of 9 digits in 3 ms. and another learned 12 digits in .75 of one second—both exceeded Mr. Finkelstein's records on these two digit groups.

THE experiments have proved that seeing is like any other skill—a habit. It is therefore susceptible of practice or training. A second important fact in visual perception is that one portion of the experience predominates. It represents a sharply defined region; it stands out. Gestalt psychologists call such a clearly defined part of experience "figure." For example, when we look out of the window at a landscape, certain objects are in the foreground, others are in the midground, and others more distant form a series of backgrounds extending to those so indistinct as to be invisible. In visual perception, as in reading a story, the figure will be the individual's interpretation of the visual symbols, which will, in their turn, be affected by ideas which he recalls, his bodily posture in sitting, his physiological condition—the slight trace of indigestion caused by something he ate at dinner, and the like. Thus visual perception is interpreted as figure and ground.

From the studies of Mr. Renshaw and his students, several facts have emerged. First, it has been found that the possibilities of individual improvement in the act of seeing are much greater than educators think. For example, after 70 training sessions using numbers of one length, the learner's performance

was still improving. The experimenter concluded from his findings that the ultimate attainment of the limit of proficiency depended upon the learner's discovery and use of the best possible method of learning, his control of his motivation, and, more important still, the development of the perceptual skill in field structuring.

A second doctoral student concluded after two years of study that the proficient perceiver uses an entirely different set of functions from those which he used when a novice. With training, the spastic tension movements of the untrained person disappear and are replaced by the smooth, organized movements of the skilled perceiver.

Another student analyzed the errors made in memorizing the several thousand slides. She found that early in training, many observers using numbers comprising a specified number of digits may get the digits in the numbers correct, but their order may be wrong—inversions of the order and other errors of position are common. "Formal process is more fundamental than the mere mastery of content."

Students have found that as their tachistoscopic skill grows, their performance in silent reading improves, indexes of comprehension are increased, and greater fluency and speed result. Three students doubled their rates in 33 practice periods and increased their rates in reading scientific material by 37, 57, 125 per cent. Two groups of adults gained 51 and 42 per cent in speed, and each group, 33 per cent in comprehension.[1] Mr. Renshaw has said:

"We have to learn to see just as we have to learn to swim, to play the piano, or to speak French. [Seeing] can be done with skill and efficiency or it can be done haltingly, and ineffectively."[2]

. . . "Seeing to be effective must be unitary, coherent, and fluent. Perceptual training by tachistiscopic methods enforces from the first this theoretically sound practice."[3]

The brief exposure which is possible with the tachistoscope compels the observer to look actively if he is to see what is exposed. Meaningless materials are used—numbers generally, since digits are as nearly meaningless as symbols can be—so

[1] All these theses are summarized by Mr. Renshaw in the article, "The Visual Perception and Reproduction of Forms by Tachistoscopic Methods," in the *Journal of Psychology* [XX (October, 1945), pp. 217–32].

[2] Renshaw, Samuel. "Seeing as a Habit," *Psychology of Vision* (Vol. I, No. 5), February, 1940, p. 3.

[3] *Loc. cit., Journal of Psychology*, p. 218.

that the individual's attention is not diverted by associations and interpretations of various sorts. Digits are used to simplify the experience so that it is limited, as nearly as possible, to its visual elements. Thus, from the individual's response, written immediately after the exposure of one-tenth, one-fiftieth, or one-hundredth of a second, the psychologist is able to determine the quality of the individual's seeing, because the psychologist knows the series of digits displayed. Since this training develops the individual's power to see the parts in relation to the whole, it is called visual-form training.

THE tachistoscopic training arranged for the first- and second-grade children in Bexley was limited somewhat by the materials. The form of the tachistoscope available for purchase is a projector with a shutter attachment which can be set at speed varying in duration from a second to one-hundredth of a second. Since the training periods were to be given in the six classrooms, it was necessary to use a portable tachistoscope. The Three-Dimension Company's Perceptoscope was used, and the slides were those especially devised for such use.

Three twenty-minute training periods were held with each group weekly. This training was begun in February, 1945, with the first-grade pupils, and continued through the second semester. Of course, as in all classroom schedules, there were interruptions—practices for the spring festival and the like. However, 42 training periods were given, which were followed by two testing periods. The training was continued in the second grade. From October to June, the first-grade pupils of 1945–46 were also given the training.

The routine of the practice period was simple. Before each slide was displayed, a descriptive statement was made, such as "The next number has 4 digits in it." This was followed immediately by the signal "ready"—an interval of 2 seconds—"now"—and a second interval of 2 seconds, which preceded the exposure of each slide. The children reproduced what they had seen on the screen immediately after the exposure.

At the beginning of each training period, each child was given a mimeographed sheet, lined horizontally, with places for his name and the number of the training period. A vertical line was drawn down the center of the page. In Figure 1, a child's paper is reproduced. The clerk who was working with

the children's papers chose it as average in appearance on the twenty-eighth day. To the left of the vertical line, you see what M—— thought she saw (*see* Figure 1). To the right of the vertical line, she has recorded what actually was on the screen.

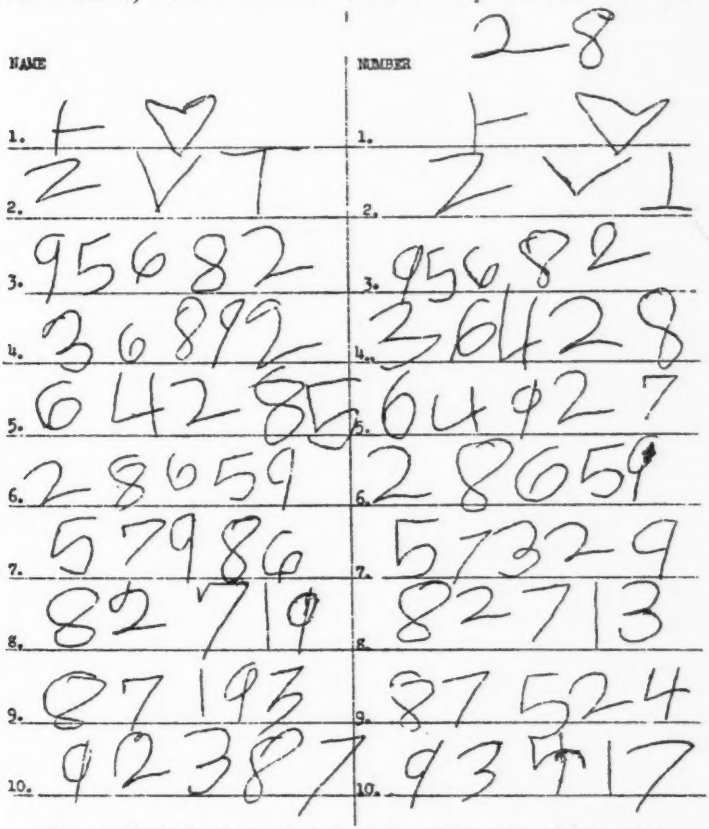

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Fig. 1. Facsimile of record of the 28th tachistoscopic-training period.

Since it is important for the learner to know how he is progressing, this requirement was met by having the children copy from the screen the number which had just been displayed.

As the training periods progressed, the children learned to focus their attention for a short time on the screen and then to relax until the signal was again given. They themselves de-

cided that they saw more accurately if they did not talk between the showings of the slides and if they did not think of other things when watching the exposure. Toward the end of the sixteen weeks of practice, the quietness of the rooms during the short training periods was often remarkable.

Many of the children learned to acquiesce, which is one of the essential characteristics of all learning. One six-year-old boy phrased it as follows when he exclaimed quite unexpectedly one morning: "I look very carefully. Then I just write any old number, and I'm generally right." He generally was right, for in correctness in reproducing the slides his record was one of the highest among those of the 120 children included in the study.

The children's ability to record the forms or digits shown on 18 or 20 slides during 20 minutes indicates the degree of concentration they developed and the skill they acquired. It is essential to remember that these children were in first grade and that the correctness of their responses was directly affected by their familiarity with the numbers or words and their skill in writing them.

THE research having to do with special materials and techniques in the teaching of reading, while less spectacular than tachistiscopic research, is equally essential in this description, since meaning, which is the factor of first importance in reading, had to be carefully guarded in the Bexley Study.

If we accept interesting content as imperative, there are several other characteristics of reading essential to successful interpretation: first, that quick recognition of words (vocabulary) is a fundamental necessity; second, that the reader must realize that the text must be read as it was set down by its author (accuracy); third, that words in their relation to each other in a sentence often give the clue to an unfamiliar word (using the context); fourth, that no true reading experience is lacking in meaning (comprehension). For guidance in the Bexley Study, these essential characteristics of the reading process were adapted to the first- and second-grade levels and to the use of the beginning reader.

The teachers in the first grade started with the premise that reading was a visual experience. Therefore, since we were going to introduce tachistoscopic training in February, we did not dissipate the children's interest by teaching phonics. The

children had to depend entirely upon the way the word looked in order to recognize it.

Our first problem was to develop a true definition of reading for each child through his own reading. For this purpose, we used experience stories. The first series used were stories about the children's own pets. The first stories were short, not more than two short sentences. The intention was to keep the children from substituting memorizing for reading. As the children began to recognize words the stories grew longer and the form varied. Each child's familiarity with the subject of the story accustomed him to the necessity of meaning in reading.

The experience story recorded on a chart, if carefully used, has several values in early reading instruction. It may be used, first, in developing an understanding of the meaning of reading:

First, the child's familiarity with the story requires that the reproduction of it be true to experience (He learns that accuracy in reading is essential.).

Second, illustrations must suit the story (He learns that meaning is indispensable in reading.).

Third, unfamiliar words can often be understood from the context (He learns that the context and interpretation supplement each other.).

Fourth, reading about his own experiences is interesting (He finds that interest is an important part of reading.).

The second value of the experience story is that it teaches the mechanics of reading: *First,* through the teacher's gestures the children become familiar with movement from left to right, return sweep, and tendency of words to group. *Second,* through the child's own use of a chart, he sees that a given word always looks the same and he later recognizes variations in the appearance of the word; that is, it may end in "s," begin with a capital letter, and so on.

To ensure that the children saw the peculiarities of the forms of the different letters, each child was given a set of cards with one letter of the alphabet printed on each card. A set contains 130 cards of five different colors—five cards for each of the 26 letters. A sample card is shown in Figure 2. In the use of these cards no mention was made of the name of the letter. The teacher chose one and the child was directed to find the other four in his set. This meant the handling of many cards and the comparison of the letter which was his sample with other letters in the alphabet, once, or perhaps several times.

The children made picture dictionaries which helped them to learn words from their experience stories. The dictionaries were not alike. Each child made his own and he chose the words which he found hard to remember and for which he could devise a picture to illustrate the meaning.

When we were ready to begin pre-primers, we introduced what we called "practice materials." An example of practice material to introduce the phrase *round and round* is shown in Figure 3. Practice materials were arranged to teach the children that meaning is essential in the interpretation of words as visual symbols. The teacher's purpose was to teach the child that words have meaning just as pictures do, and for this reason as

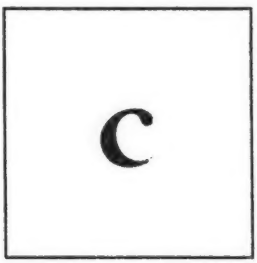

Fig. 2. Facsimile of a letter card.

many words as possible were introduced by simple pictures. On a stencil to be mimeographed, a picture illustrating a word was traced from the book in which the word appeared. Since the picture and word were introduced just before the lesson was read, the pictures in the book were used because their familiarity would aid the child later, when reading the book, to remember the words they portrayed. Also, since the word was soon to be used, only four or five repetitions of it were given. For example, in practice material to introduce the word *jump*, the word *jump* appears five times among ten words in the column under the picture. The child's task was to identify and underline *jump*.

A second value of practice materials was the emphasis which they put upon immediate memory—the word was being learned for use in the lesson, not as a permanent possession of the child. Thus the child's reading of new material—he had no access to the books except in the reading period—was not hampered by

delay caused by unfamiliar words.[4] Also, the teacher was relieved of any feeling of obligation to repeat the word until the children knew it permanently. Learning the words became a factor of reading, and interest and context were given unhampered opportunity to impress the word on the child's memory.

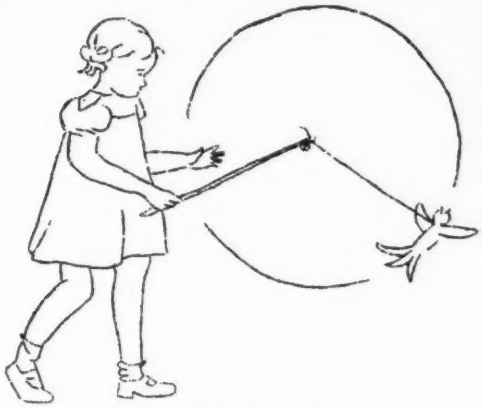

Fig. 3. Practice material prepared by one of the teachers.

EXPERIENCE stories and practice materials were arranged to aid the children to read independently. To simulate for the children the reading experience of a competent adult reader, we substituted the reading of many books for the usual practice of reading a few books intensively. Books were chosen for their interesting content and story-telling illustrations. Then, they were arranged in the order of difficulty. Two criteria were used in determining the difficulty of a book: first, the number of words in it which had already been introduced by the earlier books in the series, and second, the number of new words which it contained.[5] The purpose was to arrange the books in overlapping series so that the children would soon be able to read several pages of new material each day without preparation beyond practice materials.

Each child read with a small group of his classmates who

[4] This restriction was put only upon books used in the reading lesson. There were many books for the children's use in each classroom.

[5] MacLatchy, Josephine H. "Variety in Preprimers," EDUCATIONAL RESEARCH BULLETIN, XXIII (May 17, 1944), p. 115–17.

most closely resembled him in ability, social adaptation, and reading proficiency. The children in the fast-reading groups of Bexley read at least 12 pre-primers, 10 primers, and 6 or 8 first readers, during the year 1944–45.

The only preparation for any group's reading was the use of practice materials and the careful examination of the pictures illustrating the 10 to 15 pages which were to be read. Each child read several pages, and the selection for the day was not generally re-read during the period. In short, we tried to simulate in the child's experience in reading the experience of a competent adult reader.

Exploratory Tests

In a study of the progress of a group of children such as that arranged for the Bexley first grades, it is essential that all the objective information which can be gathered about each child be assembled. For this reason, tests of intelligence, hearing, and vision were administered by experts who appraised the findings and interpreted them for the teachers.

Although many of the children had been given the Pintner-Cunningham Intelligence Test in kindergarten, it was desirable to have a common means of appraising the ability of all the children. The Kuhlmann-Anderson Intelligence Test which was used for this purpose has a carefully devised booklet suited to the ability of the children of each school grade. The first-grade booklet includes tests of discrimination, judgment, generalization, and the like, adapted to the ability of the average six-year-old. Since this is a group test, the use of it was postponed until the children were somewhat accustomed to following directions and to working with a group.[1]

The Kuhlmann-Anderson test gives four possible ways of expressing a child's development. Of these, the "percentage of average development"—designated as P.A.—was chosen in preference to the intelligence quotient (I.Q.). This measure gives an individual's mental development in terms of an average and, in the opinion of the authors of tests, is a more accurate and useful expression of a measurement of intelligence than is the I.Q. The mean percentage of average development for the whole group was 104. The distribution of ability within the class groups was similar.

[1] The tests were given in December by the late Francis Maxfield, of the Psychological Clinic, Ohio State University, and by Miss Margaret Avey, a graduate student, under his supervision. All the papers were scored by Miss Avey.

In the audiometer test, no child in the first grade showed signs of serious hearing loss. The teachers of a few children were advised to place them near the front of the room and to give them second chances if they did not respond promptly when spoken to.

It was not possible to arrange for eye examinations for all the children. As a poor alternative, each teacher was asked to select the five or six children in her class whose reading was least satisfactory. Thirty-three children so rated were tested by Dr. Snyder, O.D., under the direction of Mr. Renshaw, in the Experimental Psychology Laboratory, Ohio State University. All of these children were marked as needing training in adequate seeing.

Later, each teacher was asked to choose the three best readers in her group. Only sixteen of these eighteen children were tested, because of delays due to illness and other causes. Only two of these children were marked "should be refracted," and three others were marked as likely needing visual training.

The tests used were not those which are commonly administered by the school nurse. The series of tests is explained in some detail by Dr. Snyder in this issue.[2]

THE Gates Reading Readiness Tests chosen by the first-grade teachers as an objective measure of the first-grade children's aptitude for reading were given by the teachers themselves during the last week in October. The time of testing was postponed until the children had become accustomed to their new surroundings, were reasonably proficient in the use of pencil and paper, and were able to follow simple directions. The teachers not only gave the Gates test to their pupils, but they scored the papers, tabulated the results, and interpreted the test findings. The composite percentile scores of the 121 first-grade pupils of the Bexley schools who took the Gates Reading Readiness Tests in October, 1944, are accumulated in Table I. According to Mr. Gates's classification, 56 pupils (46 per cent) probably will be able to learn to read "rapidly and with minimum study." He continues: "They should be able to read 'at sight' second- and third-grade materials before the end of the year." Forty-six pupils' composite percentile scores fall between 60 and 79. Mr. Gates says that pupils making these scores "should find a typical program easy and enjoyable

[2] *See* pages 168–70.

TABLE I

DISTRIBUTION OF COMPOSITE PERCENTILE SCORES OF 121 BEXLEY FIRST-GRADE PUPILS ON THE GATES READING READINESS TEST, OCTOBER, 1944

Gates Classification	Miss A	Miss B	Miss C	Miss D	Miss E	Miss F	Bexley Total
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
80–100	3	7	15	5	15	11	56
60– 79	.....	7	9	10	8	12	46
40– 59	3	2	2	5	.....	1	13
20– 39	1	2	.....	2	.....	.....	5
10– 19	.....	.....	.....	.....	.....	.....	.....
Below 10	.....	.....	.....	.....	.....	.....	.....
Total pupils	7	18	26	22*	23	24	120

* One pupil took only two of the subtests and so is not included in this tabulation of scores.

and should be able to read fairly widely without help by the end of the year." Thirteen pupils are rated by Mr. Gates's classification as "average pupils." Five of the 121 pupils fall within the "slow learners" group. No child's composite score falls below 20.

Results of the Testing Program

THE reading program in Bexley during the years 1944–46 had had several features at variance with common instructional practice. In the first grade there were the peculiarities of the use of experience stories, the development of practice materials, the use of many books arranged in a succession determined by vocabulary difficulty, instruction in flexible, small groups, and tachistoscopic training during the second semester.

In the second grade, all the techniques used in the first grade were adapted to the increased skill of the children. Stories of experiences were used to introduce new words and new groups of ideas before they were met in books. For example, the children in Miss J's class wrote a booklet about their experiences with magnets, before they read about them in science books. Practice materials gradually gave way to careful discussion of the meaning of each new word met in the group's reading. Oral reading in small, similar groups continued to be the instructional unit,[1] but it was sharply differentiated from oral reading of the dramatic, audience variety which is the type generally discussed in books on reading. Word study which,

[1] MacLatchy, Josephine H. "Techniques and Devices in Reading," EDUCATIONAL RESEARCH BULLETIN, XX (September 17, 1941), pp. 167–68.

again and again, showed the variety in the form of inflections of the words in the books read[2] was substituted for the practice of directing the child to find the short word in a long one. Letter phonics was not used, but three-letter syllables containing short-vowel sounds were presented in brief drill periods and were identified by the children as the first syllables of words pronounced by the teacher.[3] Short tests in objective form were devised by the teachers to develop the children's powers of interpretation and to enforce the habit of remembering what is read.[4] Tachistoscopic training was continued from October to June of the second grade.

Something more than administrators' approval and teachers' enthusiasm was needed to appraise the value of the reading program. Standardized tests were used as a means of measuring the children's achievement by the comparison of the average records of the group with the national norms set for these tests. In the first grade, the Gates Primary Reading Tests, Form 1, was given in January and the second form of the Gates test was administered in May, supplemented by the Metropolitan Achievement Test, Primary I Battery. To the records on these silent-reading tests were added the children's records on five forms of a test of oral reading, Gray Oral Reading Check Tests, Set I,[5] two of which were given in January, two in March, and one in May.

During the first two weeks of the second grade, Form 2 of the Gates test was repeated, the Durrell-Sullivan Capacity Test was given, and the children with third-grade ratings on the Gates and Metropolitan tests in May read Set II, No. 1, of the Gray Oral Reading Check Test, while the rest of the children read Set I, Nos. 1 and 2. The third form of the Gates test was taken by the children in January, 1946, along with Set II, Nos. 2 and 3, of the Gray test for the two best reading groups. The children in the slowest group in each class read Set I, Nos. 3 and 4. In May, the word-meaning and paragraph-meaning subtests of the Durrell-Sullivan Achievement Tests were given. All the children read Nos. 4 and 5, Set II, of the

[2] *Loc. cit.*, pp. 169–70.

[3] Bloomfield, Leonard. "Linguistics and Reading," *Elementary English Review*, XIX (April and May, 1942), pp. 125–30; 183–86.

[4] MacLatchy, Josephine H. "Tests as Learning Devices," EDUCATIONAL RESEARCH BULLETIN, XX (November 12, 1941), pp. 228–34.

[5] Set I is arranged for Grades I and II; Set II, for Grades II, III, and IV; and Set III, for Grades IV, V, and VI.

Gray test, and the children in the best-reading group in each classroom read Nos. 1 and 2, Set III.[6]

The Gates Primary Reading Test comprises three subtests —Word Recognition, Sentence Reading, and Paragraph Reading. Scores are expressed as reading grades or reading ages; only the first measure is reported here. The highest possible

TABLE II

SCORES OF ALL THE CHILDREN WHO TOOK PARAGRAPH-READING SUBTESTS OF THE GATES PRIMARY READING TEST AT EACH TIME OF TESTING

Grade Equivalents	1945			1946
	Jan.	May	Sept.	Jan.
(1)	(2)	(3)	(4)	(5)
3.75	1	3	7	28
3.55	.....	6	10	20
3.35	.....	4	8	13
3.22	.....	6	1	17
3.10	.....	10	4	3
2.90	.....	10	4	7
2.75	.....	6	6	4
2.60	.....	10	8	4
2.50	.....	7	12	4
2.40	.....	9	6	2
2.30	.....	12	8	1
2.20	.....	6	5	4
2.10	.....	3	4	3
2.00	.....	8	8	1
1.95	.....	5	4	.....
1.90	5	6	6	.....
1.85	.....	2	3	1
1.80	9	1	6	.....
1.75	11	1	2	.....
1.70	16	.....	.....	.....
1.65	11	.....	1	.....
1.60	15	2	1	1
1.55	11	.....	.....	.....
1.50	19	.....	.....	.....
1.45	15	1	.....	.....
1.40	5	1	.....	.....
1.30	3	.....	.....	.....
Number of pupils	121	119	114	113

score on each form of the word-recognition subtest is 3.3, which is interpreted as third month of third grade. The highest scores on sentence reading and paragraph reading are 3.45 and 3.75, which are similarly interpreted. The composite score on this

[6] A report on the oral-reading tests will be given in a later issue of the EDUCATIONAL RESEARCH BULLETIN.

test is the average of the individual's scores on the three subtests. The scores on the Metropolitan and Durrell-Sullivan tests are also expressed as grade equivalents, using the decimal point to separate the grade from the month.

TABLE III

THE AVERAGE READING GRADES AT THE FOUR TIMES OF USING THE GATES PRIMARY READING TESTS

Class Groups	Word Recognition	Sentence Reading	Paragraph Reading	Average Composite
(1)	(2)	(3)	(4)	(5)
	January, 1945			
Miss A	1.42	1.47	1.56	1.47
Miss B	1.39	1.47	1.45	1.44
Miss C	1.65	1.55	1.66	1.67
Miss D	1.40	1.54	1.62	1.52
Miss E	1.43	1.53	1.59	1.51
Miss F	1.79	1.66	1.80	1.75
Bexley average	1.55	1.54	1.61	1.56
	May, 1945			
Miss A	2.35	2.13	2.44	2.31
Miss B	2.33	2.40	2.40	2.38
Miss C	2.39	2.57	2.48	2.47
Miss D	2.46	2.44	2.54	2.48
Miss E	2.30	2.47	2.52	2.43
Miss F	2.56	2.75	2.85	2.72
Bexley average	2.40	2.46	2.54	2.47
	September, 1945			
Miss G	2.88	2.59	2.60	2.69
Miss H	2.49	2.52	2.64	2.55
Miss I	2.67	2.57	2.56	2.59
Miss J	2.44	2.70	2.53	2.56
Miss K	2.35	2.53	2.54	2.47
Bexley average	2.57	2.59	2.58	2.57
	January, 1946			
Miss G	3.29	2.93	3.12	3.11
Miss H	3.04	2.88	3.15	3.02
Miss I	3.06	2.97	3.11	3.05
Miss J	3.07	3.06	3.41	3.18
Miss K	3.16	3.00	3.27	3.14
Bexley average	3.12	2.97	3.21	3.10

SINCE space for reporting the statistical findings is limited, only one table shows the distribution of the scores of all the children. Table II gives the scores of the whole group on the paragraph-reading subtest of the Gates Primary Reading Test—Form 1, in January, 1945 (*see* Column 2); Form 2 in May (*see* Column 3) and in September (*see* Column 4); and

Form 3 in January, 1946 (*see* Column 5). This subtest was chosen because at each testing the average score of each class was generally highest on this subtest. Also, the average gain from May to September was least on paragraph reading. This table shows several characteristics common to the distributions of the other two subtests. The most obvious is the shift in the second and third testings toward the highest scores. This continues in the fourth testing, with the result that one-tenth of

TABLE IV

THE 75TH, 50TH, AND 25TH PERCENTILES GIVEN BY MR. GATES FOR THE FOUR TIMES OF TESTING AND THOSE ATTAINED BY THE BEXLEY FIRST AND SECOND GRADES

Subtests	Gates's Norms			Bexley Reading Grades		
	75th	50th	25th	75th	50th	25th
(1)	(2)	(3)	(4)	(5)	(6)	(7)
	January, 1945, (1.5)					
Word Recognition	1.85	1.5	1.27	1.7	1.45	1.3
Sentence Reading	1.75	1.5	1.2	1.57	1.5	1.44
Paragraph Reading	1.77	1.5	1.3	1.7	1.6	1.5
	May, 1945, (1.9)					
Word Recognition	2.3	1.9	1.5	2.6	2.3	2.15
Sentence Reading	2.3	1.9	1.53	2.9	2.4	2.2
Paragraph Reading	2.23	1.9	1.49	2.9	2.5	2.1
	September, 1945, (2.0)					
Word Recognition	2.4	2.0	1.57	3.05	2.43	2.20
Sentence Reading	2.4	2.0	1.56	3.09	2.54	2.25
Paragraph Reading	2.4	2.0	1.5	3.12	2.61	1.99
	January, 1946, (2.5)					
Word Recognition	3.0	2.5	2.05	3.33	3.29	3.05
Sentence Reading	3.05	2.5	2.0	3.40	3.10	2.60
Paragraph Reading	3.04	2.5	1.9	3.75	3.35	2.90

the children made perfect scores (composite scores of 3.51) on the three subtests. A second interesting feature is the average gain from May to September, which is slight—.04 in this subtest (*see* Table III). However, the scores of 10 per cent more of the children fall in the highest three classes of this distribution in September than in May.

The average for each class on each of the subtests and the composite scores are given in Table III for the four times of using the Gates test. The gains of the May scores over the scores on the first testing are almost the equivalent of a year

although an interval of only four months had passed. An unusual feature in school testing which appears in this table is the gain in the average scores on the subtests taken during the first week of second grade over those taken in May, which is generalized in the average composite scores as one month's gain.

In Table IV, an attempt is made to interpret the progress of this group of more than one hundred children by setting three points of the Bexley distributions at the four testing times against the author's corresponding norms. For example, the highest 25 per cent of the Bexley scores in September, 1945, fall in the first month of third grade, or thereabouts (*see* Column 5), while the author's norm for that point is fourth month of second grade (*see* Column 2). The differences on the medians set by the author (2.0) on the three subtests and the Bexley medians (2.43, 2.54, and 2.61) were not so great—from 4 to 6 months as measured by the test scores. The points (2.2, 2.25, and 1.99) below which the lowest 25 per cent of the Bexley scores fell were 5 to 7 months higher than the author's corresponding norms. In the first testing (January, 1945), the three points of the Bexley distribution approximated the author's norms. In the subsequent testings the three points of the Bexley distribution are always higher. In January, 1946, the points below which the lowest 25 per cent of the Bexley scores fell were higher than the median set by the author's norms for that time in the pupils' reading progress.

At the end of first grade, the children were given the Metropolitan Achievement Test, Primary Battery. The average scores of the six classes on each subtest and the reading averages (*see* Column 5) and achievement averages (*see* Column 7) are given in Table V. Again, the Bexley averages, given in the last row of the table are several score-months (2.5 is interpreted fifth month of second grade) above the end of first grade.

Interesting facts appear if the children's May records on the Gates and Metropolitan tests are set side by side. Eighteen children receive third-grade composite reading grades on the Gates test. All of these children received third-grade ratings on the Metropolitan test. At the other extremity of the two distributions there is some variation. Ten children's composite reading grades on the Gates test are in first grade. Only 4 of these children had first-grade Metropolitan grade equivalents. In spite of these individual variants, the grade placements of the

TABLE V

THE AVERAGE GRADE EQUIVALENTS OF EACH OF THE SUBTESTS AND THE TWO AVERAGES OF THE METROPOLITAN ACHIEVEMENT TEST, PRIMARY BATTERY

Class Groups	Word Pictures	Word Recognition	Word Meaning	Average Reading	Numbers	Total Achievement
(1)	(2)	(3)	(4)	(5)	(6)	(7)
Miss A	2.3	2.4	2.9	2.5	2.8	2.6
Miss B	2.4	2.6	2.6	2.5	2.8	2.6
Miss C	2.6	2.8	3.0	2.8	3.1	2.9
Miss D	2.4	2.6	2.7	2.6	.....	.....
Miss E	2.3	2.5	2.6	2.5	2.8	2.6
Miss F	2.7	2.8	3.2	2.9	2.9	2.9
Average	2.5	2.6	2.8	2.6	2.9	2.7

TABLE VI

THE AVERAGE SCORES ON EACH OF THE SUBTESTS OF THE DURRELL-SULLIVAN READING CAPACITY AND ACHIEVEMENT TESTS

Class Groups	Capacity—September, 1945		Achievement—May, 1946	
	Word Recognition	Paragraph Meaning	Word Meaning	Paragraph Meaning
(1)	(2)	(3)	(4)	(5)
Miss G	2.7	2.7	3.3	3.4
Miss H	3.1	2.7	3.9	3.8
Miss I	3.1	2.6	3.7	3.9
Miss J	3.1	2.7	3.4	3.8
Miss K	2.5	2.6	3.6	4.1
Bexley average	2.9	2.6	3.6	3.8

two tests resemble each other more than they differ. The closest agreement is in the percentages of children receiving first-grade ratings. Percentages showing the ratings at each grade level for each test at the end of the first grade are as follows:

	Percentage	
	Gates	Metropolitan
Reading ratings in third grade	17	28
Reading ratings in second grade	75	66
Reading ratings in first grade	8	6

During the children's second week in the second grade the Durrell-Sullivan Reading Capacity Test was given. Miss A's small group of children was not included in the second-grade study. Children from the groups designated Miss D and Miss F in the earlier tables are found in the groups of Miss G and Miss H. The same is true of the groups of Miss I, Miss J, and Miss K—each group contains children from the groups of Miss B, Miss C, and Miss E.

The average scores of each group on the two subtests of the Durrell-Sullivan Capacity Test are given in Columns 2 and 3 of Table VI. The achievement scores at the end of the second grade are given in Columns 4 and 5 of the table. Again the Bexley averages are high, in this case 6 and 8 score-months beyond the school level of the children.

The 114 children who took the Gates test during the first week in second grade had an average composite score of 5.7 score-months beyond their grade placement. Their average scores on the subtests of the Durrell-Sullivan Capacity Test, which they took soon after, were still higher than the Gates average. The gains of the January scores on the Gates test over the September scores are generalized in an average gain of 5.3 score-months in the composite score. However, the Gates test was too easy to really test the children in January, 1946, for 10 per cent of them made perfect scores on the three subtests—composite scores of 3.51. The last silent-reading scores reported here are those on the two subtests of the Durrell-Sullivan Reading Achievement Test. Again, the average scores of the 114 children are more than a half-year in word meaning, and almost a year in paragraph meaning, beyond their school placement (2.9).

Appraisal of Tachistoscopic Training

As I said earlier, the children's ability to record after brief exposures the forms or digits shown indicates the perceptual ability they developed and the skill they acquired in speedily writing numbers from memory or copying them from the screen. It is essential to remember that these children were in first grade and that the correctness of their responses was directly affected by their familiarity with the forms, numbers, or words and their skill in recording them.

During the 42 practice periods, 92 three-digit numbers were displayed. The percentages of correctness in recording these numbers after exposures of one-tenth, one-twenty-fifth, one-fiftieth, or one-hundredth of a second are given for each group in Table VII. The highest percentage of correctness is 70; the lowest is 42. The groups curiously fall in pairs of closely similar percentages. The first two are 70 and 67 per cent correct; the others 56 and 53 per cent, and 43 and 42 per cent (*see* Column 2). The percentages of the numbers not

attempted vary from 1 per cent for the group with the highest record to 13 per cent for one of the middle-percentage groups.

In Columns 4 through 10, the variations which appeared in the numbers written after the brief exposure are listed. The series 123 means that the 3 digits were in the correct order (*see* Column 2). The symbol 12x means the first two digits were correct and in correct order, but the third was wrong (*see* Column 6). The symbol 12– means that the first two digits were given correctly with no third digit (*see* Column 7).

TABLE VII

THE CLASS PERCENTAGES ON THE NINETY-TWO THREE-DIGIT NUMBERS EXPOSED ON SLIDES WHICH WERE RECORDED CORRECTLY AND PERCENTAGES WITHIN THE TYPES OF VARIATIONS*

	Correct 123	Not Attempted	Variations in the Form Recorded						
			132	213	12x	12–	1x3	1xx	1––
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Miss F	70	1	1	1	8	1	5	1	4
Miss A	67	8	1	...	6	2	2	2	2
Miss C	56	8	2	1	7	2	4	4	4
Miss B	53	13	1	1	7	1	3	3	2
Miss D	43	11	4	...	8	5	5	3	7
Miss E	42	10	2	1	10	4	5	4	4

* The percentages for each group do not equal 100 because some of the less frequent variations are not included in this table.

In Columns 4 and 5 are given percentages for the two commonest variations in which the digits were correct but their order was confused. The other variations occurred on fewer than .5 per cent of the children's papers. Before a numerical slide was displayed on the screen, the operator told the children how many digits the number contained. When the children were writing the number, they were urged to write as many digits as the number comprised. In the psychological laboratory when a subject omits the last digit in a number, if he is urged by the operator to guess, he will name the right digit 8 out of 10 times.[1] In Column 6, the percentages of three-place numbers in which the first two digits were correct and the third was wrong range from 6 to 10. The percentages for similar numbers in which the third digit was omitted, given in Column 7, are smaller, ranging from 1 to 5. The percentages of three-place numbers in which only the first number was correct

[1] Renshaw, Samuel. "Training to Perceive," Part II, *Psychology of Vision*, Vol. I, No. 12 (September, 1940), p. 2.

and the other two were wrong (Column 9) or were omitted (Column 10) range from 1 to 4 and 2 to 7, respectively. The percentages in Columns 9 and 10 are those of the children who made the least progress in tachistoscopic training.

During the 42 training periods, the average percentage of correct responses for 3-digit numbers is 55.3. When the average percentages for Columns 4 and 5 are added—those in which the digits were present but their order confused—the percentage is 56.9. This measure agrees favorably with similar records given in the published reports of two of the five visual-form studies which were in progress in 1944–45. The first of those records is the percentage of correct responses to 3-place numbers made by the superior-intelligence group comprising 34 first-grade children in the Gary study carried on by Miss Maryalice Quick under the supervision of Mr. Renshaw. The percentage (55.2) given in the report of this study was made in a series of tests taken at the end of the 106 training and testing sessions.[2] The second is the study made at National College of Education (Evanston, Illinois) by Louise Farwell Davis and her collaborators. The first-grade children were arranged in three groups. The percentage of 3-digit numbers correct made by the group with the highest reading scores (8 children) after 42 training sessions was 56.6.[3]

THE task of analyzing the papers of 72 of the 120 first-graders is not yet finished. However, the records of three groups of children—the two groups of best readers and a group which is made up of the poorest readers—have been completely compiled. The members of the group are identified by their records in the two reading tests given in May. The children in the first group received third-grade ratings on both the Gates and the Metropolitan tests. The members of the second group received third-grade ratings on the Metropolitan test only. Those in the third group received first-grade ratings on one or both of the tests. The tachistoscopic records of these three groups are summarized in Table VIII. The reader notices at once the similarity between the percentages of the first two

[2] Renshaw, Samuel. "The Influence of Tachistoscopic Training at Far Point on the Scholastic Achievement of First Grade Children," *Psychological Optics*, Vol. VI, No. 1. (November, 1945), p. 8 (*see* Table V).

[3] Davis, Louise Farwell; Ilg, Vivienne; Springer, Martha K.; and Hamck, Doreen. *First Grade Recognition Program.* Evanston, Illinois: Rowe, Peterson and Company, 1946. p. 5 (Monograph on Language Arts, No. 47).

groups and the divergence of their percentages from those of the third group, beginning markedly with the percentages of 3-digit numbers correct and continuing through the percentages of words correct. The numbers of children in the three groups are similar.

TABLE VIII

ANALYSIS OF TACHISTOSCOPIC RECORDS OF THREE GROUPS OF CHILDREN CLASSIFIED BY THEIR READING-TEST SCORES IN MAY OF FIRST GRADE

	Two Third-Grade Scores	One Third-Grade Score	One First-Grade Score
(1)	(2)	(3)	(4)
	Percentage Correct		
Numbers on slides—			
Single digits	95	93	88
Two digits	92	96	74
Three digits	79	69	26
Four digits	36	34	7
Five digits	25	23	8
Average of all numbers	49	47	20
Words	74	67	21
	Other Averages		
Gates test—May	3.27	2.66	1.89
Metropolitan test—May	3.3	3.1	2.1
Kuhlmann-Anderson (P.A.)	106	104	103
Gates Readiness—October	91	80	64
Number of children	18	14	16

THE average percentages of average development for the three groups on the Kuhlmann-Anderson test are surprisingly similar, but the differences on the average percentiles on the Gates Reading Readiness Test are interestingly different (*see* lowest row in Table VIII). Apparently, the readiness for reading of the members of the three groups had some effect on their final achievement in reading during the year.

The vision of 49 children was tested by Dr. Snyder, D.O. The sight of twelve of the sixteen children in the third group was tested by him, and all were diagnosed as in need of eye training. Sixteen children who were designated by their teachers as the best readers in their groups were also examined by him. All of these children are in the first two groups but only two of them are marked "needing refraction" and three as "likely needing eye training." It is true that a smaller percentage of them were among the children tested, while 75 per cent of the third group were tested.

The percentages of average development above 100 in the third group are distributed in this way: one, 110; two, 109; one, 107; three, 105; one, 104; two, 103; and one, 102. Seven of the 16 children have percentages of average development above the Bexley first-grade average of 104. It seems fair to infer that the failure of these 7 children to read with skill commensurate with their native ability is due to inadequate habits of seeing.

These children not only did not learn to read satisfactorily, but they did not profit by the type of tachistoscopic training given. Evidently, the chief cause of poor reading in this group was inadequate habits of seeing which were not reached by the tachistoscopic training. Four of the 46 children have taken the training prescribed by Mr. Renshaw and Dr. Snyder and have subsequently done satisfactorily both in reading and in visual-form training.

FROM the study of the word errors made on the Gray Oral Reading Check Tests, one of the objective tests, comes what seems to be an evidence of the effect of tachistoscopic training. Each teacher compiled a list of words miscalled during the reading of this oral test. After the January test, there are few errors which result from the appearance of the words. In the following list are given the words for which substitutions were made by 5 or more children.

Word Child Used	Word Used in Test	Number of Children
January—		
was	saw	15
ran	run	12
March—		
kitten	one	10
a	some	9
every	very	5
he	the boy	5
the boy	he	5
May—		
hen	her	6
catch	get	5

Three children on the March tests and 4 children on the May test substituted *was* for *saw* but they are not among the 15 children who made this substitution in January. *Ran* and *run* are not confused in the March or May tests, although *ran*

appears in each of the tests. Several of the substitutions are contextual. Substituting *kitten* for *one*—the test reads "the white one said"—did not change the meaning; this is also true of *hen* and *her*—"I want her for dinner"—and *catch* and *get*—"You did not get me, old fox." It is important to remember that the only way of interpreting a strange word which these children had was context; they did not know the sounds of the letters. The other substitutions not mentioned here occur so seldom—four times or less among more than 100 children—that they can be counted as slips of the tongue. Substitutions are a common error of first-graders. In my opinion, this record from the Gray test is one evidence that the children were learning to see words as wholes.

THE small percentages of children whose scores fell below 2.0 on the Gates test (8) and on the Metropolitan test (6) show unusual reading proficiency for the 120 children who were in the last fortnight of Grade I. It is impossible to determine the proportions of influence which should be assigned to the reading techniques used and to the tachistoscopic training. A comparison of the average achievement of this group with the achievement of the other two groups, one of which had had more than twice as many tachistoscopic-training periods is interesting, if not significant.

The experimental group of 34 children in Gary whose average intelligence quotient on the Pintner-Cunningham test is 102 had 106 training periods. The teaching in this school was rated "average," and the group's scores are compared throughout the study with those of a group of 36 children living in a similar section of Gary whose instruction is rated "superior." This last group, whose average intelligence quotient on the Pintner-Cunningham test is 100, did not have tachistoscopic training. The quintile ratings for the 119 Bexley children who had 42 tachistoscopic-training periods (*see* Column 3, Table IX) fall between the quintile ratings of these two groups whose records are given in Columns 2 and 4 of Table IX. It is important to remember that the Bexley quintiles comprise the records of 24 children, while those in Gary include only the records of 7 children.

The Metropolitan Primary Reading Test was given to 22 children in the National College Study who had more than 70 training periods. The range of average reading grade equiv-

alents is 1.6 to 3.3, with a median of 2.3.[4] The range of the Bexley group is 1.6 to 3.4, with a median of 2.75. The middle quintile for the experimental group in Gary is 2.2 and that of the control group is 2.56.

TABLE IX

RECORDS OF CERTAIN GARY FIRST-GRADE GROUPS AND THE BEXLEY GROUP ON GATES PRIMARY READING TEST

	Gary Experimental (34 children)*	Bexley (119 children)	Gary Control (36 children)*
(1)	(2)	(3)	(4)
	Word Recognition		
Quintile 1	3.06	3.2	3.2
Quintile 2	2.50	2.65	3.1
Quintile 3	2.21	2.36	2.47
Quintile 4	2.05	2.16	2.27
Quintile 5	1.51	1.92	2.02
	Sentence Reading		
Quintile 1	3.02	3.3	2.98
Quintile 2	2.25	2.69	2.70
Quintile 3	1.95	2.45	2.57
Quintile 4	1.88	2.25	2.45
Quintile 5	1.48	1.77	2.12
	Paragraph Reading		
Quintile 1	3.50	3.35	3.45
Quintile 2	2.77	2.9	2.95
Quintile 3	2.40	2.5	2.85
Quintile 4	2.10	2.2	2.35
Quintile 5	1.69	1.85	2.01

* Renshaw, *loc. cit.*, p. 6 (*see* Table III).

DO THE children learn to see unitarily? Space will allow only one incident which gives evidence on this question. During the last training period in second grade, the children of one group that had been given a series of sentences at a slow rate of exposure asked that their teacher be shown a slide which none of them had seen and at a rate faster than their exposures had been. The slide displayed the sentence: "There is a small house in the woods." It was shown one-fiftieth of a second. The teacher saw a flash of light, but could read nothing. Three children read the sentence, for they each whispered it correctly to the operator. Unfortunately, no effort was made to find out whether or not any of the 21 other children in the room had been able to read the sentence.

[4] Davis, *loc. cit.*, p. 4.

Mr. Renshaw's summary of the results of the Gary study will serve also to summarize the two-year study in Bexley:

> The evidence is clear and unambiguous: children who have had adequate tachistoscopic training in the first grade read more fluently and understandingly, show distinctly greater skill in number work, exhibit a greater range, quickness, and accuracy in general observational noting, in art work, and so on, than children of equal native ability, under teachers of equal competency in the same curriculum, who have not had this form of visual perceptual training. . . . Tachistoscopic training of the proper sort will make achievement greater, imbue [the pupil] with the feeling of mastery or aesthetic gratification which accompanies the growth of competency and set the course of sound mental habits, which, if continued in subsequent grades, may prevent the waste of failures or indifferent achievement.[5]

A Report of the Visual Status of Forty-Nine Children

By HOWARD M. SNYDER

During March and April, 1945, I made an analysis of the visual skills of 33 first-grade children of the Bexley schools. These children were selected by their teachers as the ones who were least satisfactory in their progress in reading. The results given in the second column of the table which follows were obtained:

Test of Vision	Unsatisfactory Readers (33 children)	Satisfactory Readers (16 children)
1. Visual acuity	18 normal at far point and at near point 15 below normal at far point or near point	16 normal at far and at near
2. Near point of convergence	20 below normal	All adequate
3. Rotations	20 with inadequate rotations	All adequate
4. Ophthalmoscope	1 with gross pathology	All normal
5. Retinoscope	33 need refractions	2 need refractions
6. Phorias	27 with esophoria, 2 with exophoria	3 with esophoria
7. Fusion	18 with poor fusion	5 with poor fusion
8. Spatial localization	27 with esophoric projections, and 2 with exophoric projections	5 with esophoric projections
9. Blind spots	15 with enlarged blind spots	All normal

[5] Renshaw, *op. cit.*, pp. 1 and 2.

All of these children were referred to their eye specialists through a note to their parents. A complete refraction and visual analysis was recommended in each case. All were in need of binocular training.

I also made an analysis of the visual skills of 16 first-grade children of the same schools who were selected by their teachers as the ones who made the most satisfactory progress in reading. The results obtained are summarized in the third column of the table just given. Two of these children were referred to their eye specialists for refraction, and three were referred for visual training.

During the year 1945–46, four of the children of the slow-reading group were seen by me in my private practice. Normal binocular skills were established in each case, and normal perceptual levels were developed by means of tachistoscopic exposures of digits and geometric forms in three of the four cases.

THE usual visual survey of school children consists of a distance-acuity test, an approximation of the refractive error, a determination of the presence or absence of gross pathology, and an occasional test of muscle imbalance. These tests, however, may be of little value in a program of determining reading readiness. The tests, usually made at 20 feet, overemphasize the distance-seeing skills and, in general, ignore entirely any near-seeing problem that may exist. Since it is known that there is little or no correlation between distance visual acuity and near-point visual achievement, a comprehensive visual survey must include near-point tests.

The tests used may be briefly explained as follows:

Visual acuity.—This test determines the ability of the subject to read standard test letters at 20 feet and at 16 inches. A Clason Acuity Meter was used for the distance test and a reduced Snellen test card, held at 16 inches, was used for the near test.

Near point of convergence.—The subject was asked to fixate the point of a pencil held sixteen inches in front of his eyes. The pencil was then moved forward until he saw two points or until either eye turned out. This distance was measured, from the eyes. Pupillary reactions were noted during the procedure.

Monocular and binocular rotations.—The subject watched the point of a pencil held 20 inches in front of his eyes. The pencil was then moved in circular and lateral directions,

and the pursuit ability of the eyes was noted. Monocular and binocular tests were made.

Ophthalmoscopic findings.—The interior of the eye was examined with a National Ophthalmoscope to determine the presence or absence of gross pathology.

Retinoscopic findings.—A National Retinoscope was used to measure the refractive status of the eyes. The subject maintained fixation at 20 feet.

Phoria tests.—These tests determine the relative position of the eyes in the absence of binocular vision. They were made at 20 feet and at 16 inches, and through different types of lenses. A tendency toward divergence is an exophoria, while a tendency toward convergence is an esophoria.

Fusion tests.—Two dissimilar objects were presented independently and simultaneously to each eye. The ability of the subject to perceive them as a single object was determined by this test. The tests were made at 20 feet and at 16 inches.

Spatial localization.—This test determined the ability of the subject to localize the position of objects seen in space. One-half of a stereo-view was presented to one eye field by means of a standard stereoscope. The subject, with a pointer held in the other eye field, localized the apparent position of the objects seen in the projected view.

Blind spots.—The apparent size of the projection of the normal blind spots was measured by means of a Stereocampimeter. Deviations from the normal were noted.

In these tests we are particularly concerned with the integrity of the binocular seeing act, measured in terms of these basic skills. Since normal binocular vision is essentially the organization of these basic skills into a stable unitary system of seeing, any loss or cancellation of these basic skills will result in a disorganization of the total process, with a concomitant lowering of visual achievement. Visual anomalies, then, must include these interferences in the total binocular seeing pattern, as well as structural defects of the eyes themselves.

Due to a lack of interprofessional understanding of seeing problems, many school children do not receive adequate visual care. Too much emphasis has been placed upon the structural, mechanistic concept of seeing, and too little emphasis has been placed upon the dynamic, functional concept of seeing. In appraising the results of proper visual care, in terms of visual achievement, however, the full importance of the functional concept of seeing must be recognized.